



Sand provenance documents continuing accretion of the pro-wedge and erosional unroofing of the retro-wedge during arc-continent collision (Taiwan)

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The Taiwan doubly-vergent orogenic wedge developed during collision between the Luzon volcanic arc and the Chinese passive continental margin since the late Miocene (Byrne et al., 2011). In the east, the Coastal Range represents the northernmost extension of the Luzon arc and includes Neogene volcanic rocks and Plio-Pleistocene siliciclastic deposits. West of the plate boundary, running along the Longitudinal Valley, the Central Range includes polymetamorphic rocks (Tananao Complex) and a Slate Belt (Backbone Range and Hsuehshan Range). Farther to the west, the Western Foothills are a fold-thrust belt incorporating Oligo-Miocene sediments of the Chinese margin and younger foreland-basin deposits. High-resolution framework-petrography and heavy-mineral analyses were carried out on 106 samples collected from major rivers and beaches all around Taiwan in October 2012. The Coastal Range sheds feldspatho-lithic volcanoclastic sands including rich clinopyroxene-hypersthene suites with kaersutitic hornblende. Recycling of Plio-Pleistocene siliciclastics produces quartzo-lithic sands with cellular serpentinite and poor suites including hypersthene, epidote, clinopyroxene, kaersutitic hornblende and rare Cr-spinel. Similar mineralogy characterizes detritus from the Liji Mélange. Sands from the Tananao Complex are quartzo-lithic metamorphiclastic with common marble grains, sporadic metabasite, and moderately rich epidote-hornblende suites. Sands from the Slate Belt are invariably quartzo-lithic with very poor zircon-tourmaline suites. Phyllite and slate grains dominate in the east (Yuli Belt), slate grains in the middle (Backbone Range), and shale/siltstone and slate grains in the northwest (Hsuehshan Range). Neogene strata of the foothills shed litho-quartzose sands with poor suites including zircon, tourmaline, and garnet. Sands from the Tatung volcano are feldspatho-quartzo-lithic with extremely rich hypersthene-clinopyroxene suites including kaersutitic hornblende. The study of modern sands confirms in full the opposite compositional trends observed through time along the eastern and western sides of Taiwan (Nagel et al., in press). While the retro-wedge is gradually unroofed in the east, increasing recycling of sedimentary strata reflects progressive forward growth of the pro-wedge in the west. The interplay between tectonic and erosional processes in different parts of Taiwan is highlighted efficiently by the detailed quantitative analysis of different rock fragment types (Dorsey, 1988; Garzanti and Vezzoli, 2003), which provide most valuable direct information in provenance studies.

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